

SYNTAX

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OF PERSONAL COMPUTERS

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Subscribers: Remember to return your white renewal card early to get a free SYNTAX binder.

TIMEX TO RETAIL TS1000 PRODUCTS IN JULY

Although not specific, Timex Computer Corporation plans to have TS1000 products in some "major department and discount stores" by late July according to a Timex spokesman. Timex has 14 software packages, ranging \$9.95 to \$19.95, in addition to \$99.95 TS1000 computers and \$49.95 16K RAMs.

TS1000 service will be in Timex' Little Rock, AR, repair facility; current ZX80/81 owners should still send their machines to Microsync for in-warranty service. No details yet on an 800 number support line.

MINDWARE INTRODUCES ZX-TS1000 PRINTER

At the recent Consumer Electronics Show in Chicago, Mindware, Inc. revealed their new MW 100 printer. The 16-column, 5x7 dot-matrix printer works with 8K ZX computers and TS1000s, using disposable endless-loop ribbon (blue or black) and 1 3/4" plain paper tape from office supply stores.

You need no interface or extra power supply; the MW100 plugs directly on the rear edge connector and extends the buss for your use. Using keyboard commands LLIST, LPRINT and COPY, the MW printer operates in 3 modes: wraparound, 16 column truncated, and split screen. Split screen dumps the left half of a screen, then the right half, to the printer. Print speed is 16 cps.

According to Mike Levy of Mindware, shipments will start in late July. Price: about \$120. (Watch SYNTAX for an early review.) Mindware, Inc., 70 Boston Post Road, Wayland, MA 01778, 617/358-7175.

NATIONAL ELECTRONICS III CLOSES SHOP

National Electronics III of Concord, TN, is no longer in operation. They formerly repaired out-of-warranty ZX80/81s, as reported in SYNTAX, Feb.82.

NEW PRODUCTS AND SERVICES

Exclusively for users in the LA-MS area: Nonauthorized out-of-warranty service on ZX81 kits. Price: \$8.50/hr (1 hr. min.) plus parts. Tracy Norris says turnaround runs 48 hours. Send your computer with a detailed description of the problem; they will write or call collect with an estimate. Norris Radio and Electronics, 144 Terry Dr., Slidell, LA 70458.

ZX80/81 Users' Library will run a user-generated program library. Subscription service will sell programs (\$1.50 for 1K, \$3 for 16K) to members and trade two free programs for accepted submissions. A newsletter will be published periodically, according to a Users' Library release. Yearly subscription \$25 in US, \$32 outside US. New subscribers before 7/31/82 get 15 months for the year price. ZX80/81 Users' Library, Suite 434, 4614 Kilauea Ave., Honolulu, HI 96816.

You can now buy the ZX99 automatic tape controller in the US. You get software control of up to 4 tape recorders using a 2K ROM containing the tape operating system, accessed by USB calls. It also has a built-in RS 232 printer interface and ASCII converter so you can hook any serial printer to an 8K computer. Price: \$150. Also available, a cased big keyboard with repeat key for \$75 and game and application software under \$20. Data-assette, 52 S. 3rd St., Oxford, PA 19363, 215/932-3626.

Cheap 16K memory for ZX81s costs only £19.95 (about \$34.90). It uses NMOS 4116 dynamic RAM chips and runs on the computer's power supply. According to EconoTech, it has snug-fitting gold-plated contacts, is fully compatible with ZX printers and comes with a 6-month guarantee. EconoTech, 30 Brockenhurst Way, London, UK SW16 4UD.

Call 800/225-4876 (toll-free) 9-4 EST M-F to discuss microcomputer interference problems. Free 40-page product catalog. Electronic Specialists, 171 S. Main St., Natick, MA 01760, 617/655-1532.

VOTEM, an analog interface, plugs directly into 8K ZXs with no hardware mods, allowing your computer to measure voltage and temperature. Price: \$39.95 kit; \$59.95 built and tested. Down East also offers 6116 memory (2Kx8) to upgrade ZX81s to 2K for \$11.95. Contact Down East Computers, P.O. Box 3096, Greenville, NC 27834.

LJH now offers painted aluminum keyboard enclosures to fit their big keyboards. The 13x10x4" case houses one computer and 16K or 64K memory pack. \$45+\$5 shipping excludes keyboard. LJH Enterprises, PO Box 6305, Orange, CA 92667, 714/780-1422.

Get 16K-64K of directly addressable RAM with Memotech's stackable memory modules. Prices: 16K-\$59.95; 32K-\$94.95; 64K-\$179.95. Another plug-in provides high res graphics with 192x248 memory- and bit-mapped pixels, \$149.95. A Centronics parallel printer interface works with dot matrix or daisywheel printers. It uses keyboard printer commands, converts to ASCII, and can print in lower case, \$94.95. Memotech Corp., 7550 W. Yale Ave., Denver, CO 80227.

CONFUSING THE ISSUE

Radio Shack has discontinued the TRS-80 4K color computer. Now you can buy the 16K machine (\$399), BUT without Extended Color BASIC. Take care in comparing this machine to Sinclair's Spectrum specs. Extended Color BASIC adds 30 statements and 14 functions to COLOR BASIC and you pay \$99 more to get them. Spectrum offers 16K and full color control in the basic machine.

USERS' GROUPS

Here are the groups we've heard from recently. If you'd like to list your group, call 617/456-3661 or drop us a note. We'll send interested people in your area. To locate a group, call or write (send a self-addressed stamped envelope). We'll send you the address of any local group we know of.--AZ

Central Virginia: Central Virginia Users' Group, Herb Miller, Rt. 1 Box 192, Troy, VA 22974, 804/589-8151.

Pittsburgh, PA: Pittsburgh Area Computer Club, Special Interest Group--Sinclair, c/o Dick Welsh, 1605 Middlecrest Dr., Glenshaw, PA 15116, 412/487-0789.

North Suncoast, FL: Pasco-Hernando Users' Group, John Dowlan, PO Box 5021, Spring Hill, FL 33526, 904/683-3961.

Atlanta, GA: Atlanta ZX80/81 Users Group, c/o Phil Hoffstadter, PO Box 2842, Atlanta, GA 30301, 404/296-8009 after 6 PM.

Milwaukee, WI: Robert C. Harris, 5827 N. Maitland Ct., Milwaukee, WI 53217.

Chattanooga, TN: Chattanooga Area Sinclair Users, c/o Dan Williams, PO Box 1321, Collegedale, TN 37315.

San Diego, CA: Contact Robert Jorgenson, 3814 Coleman Ave., San Diego, CA 92154, 714/424-6202.

NEW CATALOGS AVAILABLE--FREE

Gladstone Electronics, 901 Fuhrmann Blvd., Buffalo, NY 14203, 716/849-0735, or 1736 Avenue Rd., Toronto, Ontario M5M 3Y7, 416/787-1448.

Softsync, Inc., PO Box 480, Murray Hill Sta., New York, NY 10156, 212/685-2080.

SOFTSYNC, INC.
ZX81

**NEW
RELEASES!**



ROAD TO RICHES

ROAD TO RICHES is an entertaining and educational computer game in which up to four players are given opportunities to invest in business ventures in an attempt to increase their assets.

The program simulates a fast-moving world of investment in which you are confronted with all kinds of investments ranging from conservative real estate opportunities to highly risky Broadway shows.

Pit yourself against a wheeler-dealer and see if, over a period of seven years, you can come out on top. ROAD TO RICHES is fun and informative, realistically portraying the risk and skill of high finance.

16K \$14.95

HANGMAN



We've created a learning tool for you and your children which contains seven versions of Hangman for the ZX81. Your child can play against the computer's five pre-recorded libraries of categorized words: Animals, Science, Countries of the World, States of America and Fruits and Vegetables.

You can also play against opponents and the computer will request players names and keep score.

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BYTE-BACK CO.

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LEESVILLE, SOUTH CAROLINA 29070

CHECKS



HOUSEHOLD FINANCES--8K/16K

This program can help put your household finances on a business-like basis. It requires 8K ROM and 16K RAM.

To conserve memory for data, the set-up procedure is done in the immediate mode, thus using no program storage space. Type in the program (ignore inverse video in line 630; the computer switches it after a save and reload), then follow these steps:

1. Type DIM A\$(10,13) and press ENTER or NEWLINE.

2. Type in this program:

```
800 FOR K=1 TO 10
```

```
810 INPUT A$(K)
```

```
820 NEXT K
```

Press GOTO 800. Then type in 8 expense categories, such as FOOD, HOUSE, AUTO, and so on, pressing ENTER or NEWLINE after each. Use the last two categories for income, such as SALARY and BONUSES. Each category can have up to 13 charac-

ters. After entering your categories, delete lines 800-820.

3. Press GOTO 10. Your 10 categories will come up with corresponding letters.

4. Select M (for CLEAR MONTH) then N (for CLEAR YEAR).

You're ready to go. The program is self-saving (option L) and self-starting on reload to protect data from accidental erasure by RUN.

After viewing a statement (option K), press CONT to go back to the menu.

With a 16K RAM, this program leaves you about 12.6K bytes to fill. The inverse characters are HOUSEHOLD FINANCES in line 20 and CURRENT STATEMENT in line 150.

Variables and Strings

A\$ category name array

A(K) monthly array

B(K) yearly array

K For/To (primary)

J For/To (secondary)

M(J) Print scratchpad

Q Monthly total R annual total

S Address T Line pointer

U Tab pointer Z\$ Entry string

James W. Holder, Huntsville, AL

```
10 CLS
20 PRINT AT 2,6;"HOUSEHOLD FIN
ANCES";AT 4,0;"ENTER LETTER AND
AMT. A$ "A9.95";AT 6,2;"A=";
A$(1);AT 6,14;"F=";A$(6);AT 7,2;
"B=";A$(2);AT 7,14;"G=";A$(7);AT
8,2;"C=";A$(3);AT 8,14;"H=";A$(
8);AT 9,2;"D=";A$(4);AT 9,14;"I="
;A$(9);AT 10,2;"E=";A$(5);AT 10
,14;"J=";A$(10);AT 12,7;"ENTER L
ETTER ONLY";TAB 2;"K=STATEMENT";
TAB 14;"M=CLEAR MONTH";TAB 2;"L=
SAVE";TAB 14;"N=CLEAR YEAR";AT 1
6,0;"INSURANCE BENEFITS ARE NEGA
TIVE.NEGATIVE BALANCE SHOWS BENE
FITS EXCEED PREMIUMS."
30 INPUT Z$
40 IF CODE Z$=48 THEN GOTO 120
50 IF CODE Z$=49 THEN GOTO 620
60 IF CODE Z$=50 THEN DIM A(10)
70 IF CODE Z$=51 THEN DIM B(10)
80 IF CODE Z$>47 THEN GOTO 30
90 LET A(CODE Z$-37)=A(CODE Z$
-37)+VAL Z$(2 TO )
100 LET B(CODE Z$-37)=B(CODE Z$
-37)+VAL Z$(2 TO )
110 GOTO 30
120 CLS
130 DIM M(2)
140 LET S=350
```

```

150 PRINT AT 2,0;"CURRENT STATE";
AT 4,0;"CATEGORY";TAB 16
;"MONTH";TAB 25;"YEAR"
160 LET T=5
170 FOR K=1 TO 10
180 LET M(1)=A(K)
190 LET M(2)=B(K)
200 PRINT AT T,0;A$(K);TAB 14;"
$";TAB 19;".00 $";TAB 29;".00"
210 LET U=14
220 FOR J=1 TO 2
230 IF M(J)<0 THEN GOTO 250
240 IF M(J)<10000 THEN LET U=U+
1
250 IF ABS M(J)<1000 THEN LET U
=U+1
260 IF ABS M(J)<100 THEN LET U=
U+1
270 IF ABS M(J)<10 THEN LET U=U
+1
280 PRINT AT T,U;M(J)
290 LET U=24
300 NEXT J
310 LET T=T+1
320 IF K=8 OR S=460 OR S=540 TH
EN GOTO 5
330 NEXT K
340 GOTO 5
350 LET Q=0
360 LET R=0
370 FOR J=1 TO 2
380 LET Q=Q+A(J)
390 LET R=R+B(J)
400 NEXT J
410 LET S=460
420 PRINT AT T,0;"TOTAL EXPENSE
";TAB 14;"$";TAB 19;".00 $";TAB
29;".00"
430 LET M(1)=Q
440 LET M(2)=R
450 GOTO 210
460 LET T=T+1
470 LET S=490
480 NEXT K
490 PRINT AT T,0;"TOTAL INCOME"
;TAB 14;"$";TAB 19;".00 $";TAB 2
9;".00"
500 LET M(1)=A(9)+A(10)
510 LET M(2)=B(9)+B(10)
520 LET S=540
530 GOTO 210
540 LET T=T+1
550 PRINT AT T,0;"PROFIT/LOSS";
TAB 14;"$";TAB 19;".00 $";TAB 29
;".00"
560 LET M(1)=A(9)+A(10)-Q
570 LET M(2)=B(9)+B(10)-R
580 LET S=600
590 GOTO 210
600 STOP
610 GOTO 10
620 CLS
630 PRINT AT 6,0;"PREPARE TO SA
VE; START RECORDER RUNNING; TOUC
H "N/L""
640 PAUSE 40000
650 SAVE "HOUSEHOLD FINANCE"
660 GOTO 10
SYNTACTIC SUM: 64963, 8K

```

WANT A SINCLAIR PRINTER but don't want to wait or send to England? Check Gladstone's new catalog--ZX printer \$135 US or \$169.95 Can. Gladstone Electronics, 1736 Avenue Rd., Toronto, Ontario, M5M 3Y7, 416/787-1448.

BEGINNERS' BASIC--MORE ON INKEY\$

As we saw in May 82, the 8K ROM's INKEY\$ function "watches" the keyboard and looks for a keypress. When used with PAUSE, INKEY\$ tells the computer to wait for the user to press something.

You can use INKEY\$ to either make the computer stop program execution if any key is pressed, or stop unless any key is pressed.

In either case, remember the PAUSE statement that makes the computer wait. Because you want to control when the program stops or continues, use a nice big value like PAUSE 40000. This gives you enough time to choose what to do before the computer goes on without you--the bigger the value, the longer the PAUSE.

To stop execution if any key is pressed, add a line like this after the PAUSE statement:

```
100 IF INKEY$="" THEN GOTO 100
```

This line checks to see if any key is pressed. The null string ("") means no key. Thus any keypress at line 100 (making the IF part true) causes the computer to GOTO 100. As long as you hold a key, the program loops back on itself at line 100. This "holding pattern" effectively makes the computer wait until you let up on the key.

This method also lets you program a keyboard-controlled reset. At any time in your program, you can insert a PAUSE and INKEY\$ combination to allow the user to stop using the program or to start over. Change line 100 to IF INKEY\$<>"" THEN STOP to end the program. Or use IF INKEY\$<>"" THEN GOTO the first program line.

To stop execution unless any key is pressed, use this line:

```
100 IF INKEY$="" THEN GOTO 100
```

Here the null string, or no key, causes the computer to stay at line 100. Now the computer waits until a key is pressed (so INKEY\$ does not equal "") to go on.

KEYBOARD SCANNING FROM MACHINE CODE

One of the problems you must solve when writing machine code for a ZX80/1 with 8K ROM is deciding how best to scan the keyboard. Although there is a Keyboard Scanning routine at 02BB and a Keyboard Decode routine at 07BD, it is preferable on the whole not to use either of these directly.

In SLOW mode, the system variable LAST K (dec. 16421/2, hex 4025/6) holds the "key-value" of the last key pressed. Pressing a key forces an exit from the display routine after the Keyboard Scanning routine has detected that a key was pressed.

This Key-Value Demonstrator program shows the key-values for the ZX80/1's different keys:

KEY-VALUE DEMONSTRATOR

```
10 SCROLL
20 PRINT INKEY$;TAB 7;PEEK 164
21+256*PEEK 16422
30 GOTO 10
```

SAMPLE RUN

```
1 65535
2 65015
3 64503
4 63479
5 61431
```

You'll see the key-value for no-key is 65535, for 1 is 65015, and so on.

Knowing these values in a machine code program in SLOW, you can read the system variable, LAST K, and match it against known key-values. Or you can stay in a loop until you press a certain key. This method works well, but you have to be careful with multiple keying.

To use this method, you must be sure the machine code program is in the SLOW mode. How can you select FAST and SLOW from machine code?

You can select SLOW by calling either 0F28 (old 8K ROM) or 0F2B (improved 8K ROM--new 8K ROMs should be improved). Select FAST by calling 0F20 (old ROM) or 0F23

(new ROM). Because some people may have old ROMs, I use this construction for FAST/SLOW selection to make my program ROM-independent:

```
START LD HL,+NEXT ;6 bytes
      further on
      PUSH HL      ;push address
                  ;onto stack
      LD HL,(SLOW  ;SLOW=0CAC
      or FAST)     FAST=0CAF
      JP (HL)      ;call SLOW or
                  FAST
```

NEXT ;now proceed

This routine works by looking up the appropriate address in the "parameter table." Note that calling SLOW is really "going to SLOW mode" if it is available and working.

The FAST/SLOW Keyboard Scanning program following is my preferred method of keyboard scanning. It is a copy of Sinclair's method and so has the same "feel" as obtained when entering BASIC.

The machine coding is cunning as it uses an apparently never-exited loop:

```
04CF SLOW-DISP BIT 0,(HL)
                        JR Z,04CF,SLOW-
                        DISP
```

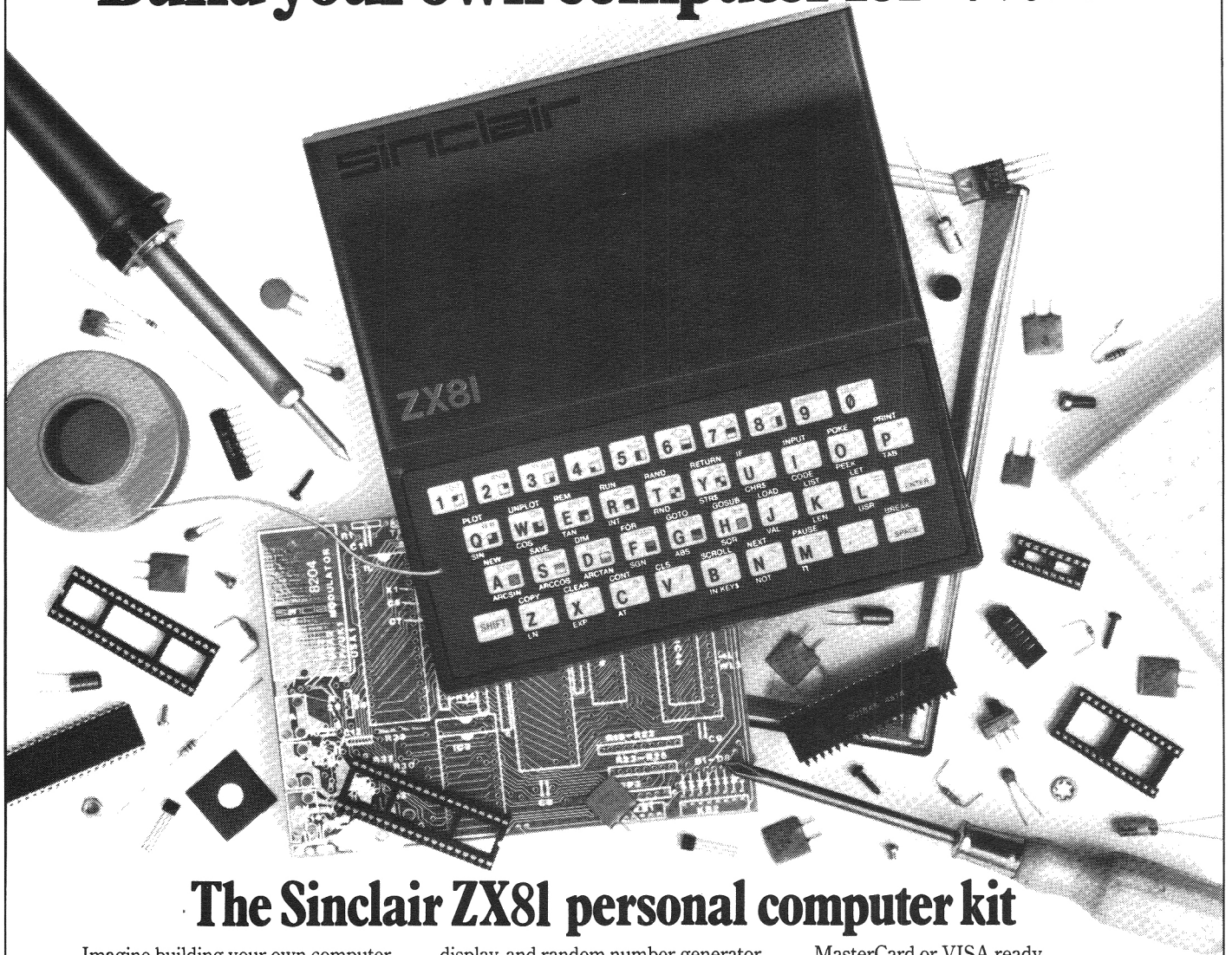
The answer is that in SLOW mode, bit 0 of (HL) becomes set whenever a key is pressed.

This machine code routine also caters to multiple-keying and sets the debounce mechanism to its correct value. Note the routine is set up to return the character code of the unshifted key being pressed. It is printed using a D7 instruction only for for convenience of the demonstration.

```
10 REM 12345678901234567890123
4567890123456
20 REM NOW ENTER THE ROUTINE
30 LET A$="213B40CB7ECC2902CB4
528FCED4B2540CBC0FDCB3B863EFF322
740CDBD0730E04678D7C9"
40 FOR A=1 TO 36
50 POKE 16513+A,16*(CODE A$(A*
2-1)-28)+CODE A$(A*2)-28
60 NEXT A
100 REM NOW CALL THE ROUTINE
110 SCROLL
120 RAND USR 16514
130 GOTO 100
```

Ian Logan, Skellingthorpe, England

Build your own computer for \$79.95



The Sinclair ZX81 personal computer kit

Imagine building your own computer for only \$79.95!

That's exactly what you can do with the ZX81 kit. It comes with all the parts you need and complete diagrams and instructions for putting it together. All you have to supply is soldering iron, solder, and a screwdriver. Plus, of course, a little bit of work.

But you get a lot more than several hours of kit-building fun. You also get a surprisingly powerful personal computer. The ZX81 hooks up to any TV for a 32-character by 24-line display (we provide the connecting cables). You can also use a standard cassette recorder to store your programs (again, we provide the cables).

Most important, you get a BASIC programming language that's powerful enough to challenge and interest the most experienced programmers. The ZX81 can handle multidimensional string and numerical arrays. It has full mathematical functions accurate to eight decimal places. Single-key entry for every command. Syntax error detection, debugging codes, and easy editing. Plus features that are ideal for creating games, such as 20 graphic symbols, continuous

display, and random number generator.

The ZX81 can be expanded too. You can increase the memory from 1K to 16K with our Memory Module for \$49.95. And you get a comprehensive manual that completely documents the capabilities of the ZX81, and teaches programming from the ground up.

In short, you get all the features that have made the Sinclair ZX81 the fastest selling personal computer in the world. And you get the satisfaction and fun of building it yourself.

A few years ago, this kind of computer power was simply unavailable to the individual. Even today, most personal computers are too expensive to buy for personal use.

But the ZX81 kit can be yours for only \$79.95. Take advantage of this unique offer today. To order, send the coupon along with a check or money order. Or for faster delivery, call our toll-free number and use your MasterCard or VISA.

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Shipping and Handling	\$4.95		\$4.95
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Sinclair technology is also available in Timex/Sinclair computers under a license from Sinclair Research Ltd.

sinclair

SIMPLE 4K-8K ROM SWITCH

I received the 8K ROM upgrade for the ZX80 and was disappointed to find that I could not load programs in integer (4K) BASIC. I interchanged ROMs, and of course, I soon bent some terminals. Faced with the prospect of many hours of rewriting, I decided there had to be a better way. There is! In the Sept. 1981 Microcomputing is an article entitled "DOS Mod" by Scott King. Borrowing his idea, here is how to run integer and 8K BASIC in your ZX80 without unplugging ROMs.

First, be aware that static electricity can instantly destroy ROMs; observe these precautions while working with them. Both you and the surface you work on must be grounded. Attach a flexible copper wire to the central screw holding the face plate of a grounded wall receptacle. Strip 2" of insulation off the free end. Keep this wire in contact with your body during the modification procedure. Loop the bare end around your wrist, or ankle or tuck it in your shoe, but remember to unwind when you leave the work bench! Next, spread a sheet of aluminum foil over the working surface.

You will need a grounded (3-wire) solder iron with a fine tip (less than 1/8" diameter), needle nose pliers and fine wire cutter and stripper.

Use an ultra-miniature single-pole switch you can fit inside the ZX80 case when mounted on the lid. Radio Shack sells a suitable part. You will also need electronic-grade rosin-cored, fine-gauge solder and 9" of 30 gauge insulated wire.

Remove the cover of the ZX80. Use a small screw driver to lift the ROM from its socket by prying up not more than 1/32" at each end.

Each ROM is coded at one end with a recess, dimple or dot on the top surface. Arrange this feature to point away from you. Pin #24 is now furthest away and to the right

of the key-feature. Gently bend this pin up using needle nose pliers. Do not lever against the ROM package, rather, squeeze the bend in the terminal to straighten it. Repeat for the second ROM.

Pin #24 is Vcc or the positive power supply for the ROM. Switching current to this terminal activates, and interrupting, disables the ROM.

You received your 8K ROM with terminals imbedded in conductive black foam. If you still have it, use it for the next steps.

Insert one ROM into this foam pad up to the shoulders of the terminal. Place the second ROM piggy-back as shown in the drawing. Align the pins carefully and make sure the lower ROM pins spread outward to contact the socket. Tack the ROMs together except at the two pins #24. Use an absolute minimum of solder. Do not allow solder to run below the shoulder of the lower ROM pins or you can't re-insert the assembly in its socket. The foam helps control the solder. If you are unsure about this step, try it on old ICs.

Inspect for shorts and remove excess flux with a Q-Tip dipped in alcohol. Vodka will do. With the key-pad closest to you, the dimple on the ROM packs should point away leaving the two pins #24 to your right. Re-insert the dual ROM assembly in its socket.

Check your connecting switch for size. There should be room to mount it inside the ZX80 case just "north" and slightly "east" of the ROM assembly. Make sure that with the switch mounted and lid closed nothing touches the PC board! I needed to trim about 1/16" off my switch terminals.

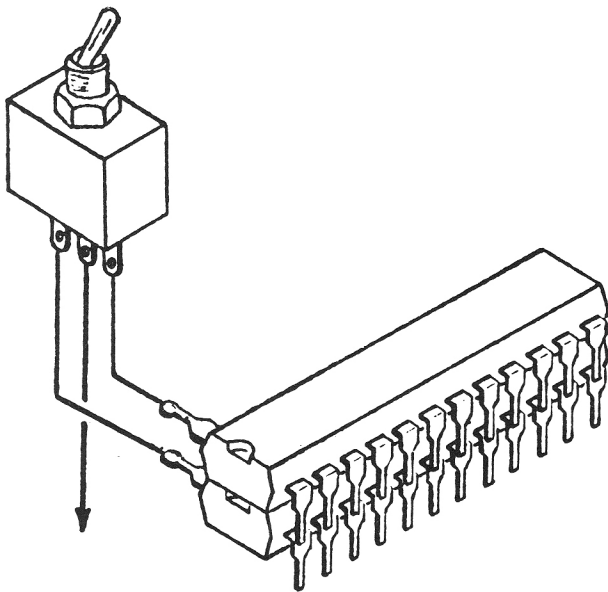
Mark the switch position on the lid and drill a mounting hole. in the latter. I sawed about 1/4" off the toggle to reduce its protrusion from the case surface. Mount the switch; this locates it with the lid laid beside the ZX80, about 3" from the ROM assembly.

Cut three 3" lengths of 30 gauge wire. Strip and tin 1/16" of each end.

Leading into the ROM socket at pin #24 find a wide printed circuit conductor run. Quickly solder one wire to this run on the PC board. Don't overheat the PC board. The other end of this wire goes to the common, usually central, post on the switch. Connect the other two wires between each switch pole and the two pins #24 sticking out from the ROM assembly.

Carefully replace the ZX80 lid taking care not to pinch or break a wire. Power-up your system and see which switch positions correspond to integer and 8K ROMs. I suggest you disconnect your power supply before switching between ROMs. You can not, of course, load a program into RAM and then switch ROMs.

Martin Oakes, Freeport, IL



FLYING BIRD

This short 8K routine shows how to put graphics in motion. It displays a flying bird, seen best

Software Breakthrough!

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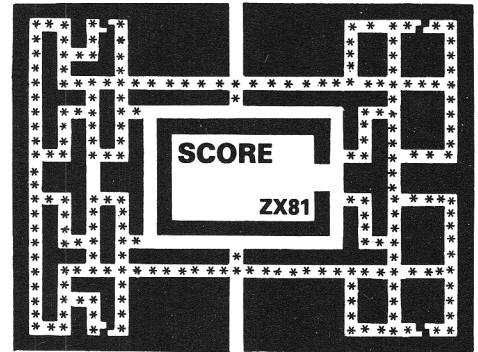
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if viewed from a distance. To change the bird's speed, change the PAUSE statements (lines 45 and 55). If you delete 45 and 55, it resembles a bat.

Mike Hastie, Concord, MA

This listing is printed on CAI's 40-column printer in regular mode. For a full review of the printer, see page 20.--AZ

```
0005 REM FLYING BIRD
0010 LET A=10
0020 LET B=11
0030 REM USE SHIFTED GRAPHIC "T" AND "Y"
0040 FOR BIRD
0050 PRINT AT A,B;" "
0060 PAUSE 15
0070 PRINT AT A,B;" "
0080 PAUSE 15
0090 PRINT AT A,B;" "
0100 LET C=INT(RND*2+1)
0110 LET D=INT(RND*2+1)
0120 IF C=1 THEN LET A=A+1
0130 IF D=1 THEN LET B=B+1
0140 IF C=2 THEN LET A=A-1
0150 IF D=2 THEN LET B=B-1
0160 GOTO 40
SYNTACTIC SUM: 19143, 8K
```

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DEAR EDITOR

I wrote a small machine code monitor for my 1K ZX81. Everything works fine but I must go back and forth to BASIC to get into and out of FAST mode (cassette operations only execute in fast mode). How can I do this within my monitor?

Clark A. Calkins, Walnut Creek, CA.

To call FAST: Jump to OF23. This is a ROM subroutine, ended by RET. To call SLOW: Call OF2B which jumps to 0207 which returns following 0226.--KO

The newly released Fujitsu MB8416 2Kx8 bit random access memory makes it easy to expand the Sinclair "on-board" RAM to 2K. Since the MB8416 has the same 24-pin configuration as the 4118 RAM, just move jumper L1 to the L2 position and insert the new RAM in exactly the same position as the old one.

If your ZX81 comes with two 2114 RAMs, replace the 18-pin socket at the IC4a position with a 24-pin one (try the Augat 524AG11D or the Radio Shack 276-1989 socket). (SYNTAX suggests using a 28-pin socket around the existing 18-pin socket.--KO) Then move the jumper and install the new RAM. Don't bother removing the second 18 pin socket at the IC4b position, just leave it empty. Be careful not to lift the printed circuit foil when removing sockets.

This change is easy because Fujitsu's MB8416 is a static RAM. It does not need the extra pins required to refresh dynamic RAMs like the 4816 (not to be confused with the Fujitsu MB8416) recommended by Sinclair for expanding ZX81 memory. So you don't need a new IC socket if a 24-pin one is already installed. Also the static RAM appears to be easier to get to work properly than the dynamic type (see Jan.82, p.12).

Some readers may find parts available only at distributors with large minimum orders. Most distributors will waive this rule if you pay for everything in advance, including postage if necessary.

New England readers should call Comp Rep Associates, Westwood, MA at 617-329-3454 for information on stocking distributors nearest them. Others can contact Fujitsu Microelectronics 1841 Hicks Road, Suite D, Rolling Meadow, IL 60008, 312/934-6400 or Fujitsu Microelectronics, 2985 Kifer Road, Santa Clara, CA 95051, 408/727-1700. One MB8416 costs about \$13.50 and the socket between 79¢ and \$2.85 depending on the type you get.

William D. Jordan, Boston, MA

P.S. I have just discovered that besides MB8416, Fujitsu makes an even cheaper RAM, the MB8128. It sells for \$11.50 each in quantities of 1-24. It is equivalent to both the Fujitsu MB8416 and the Hitachi 6116. I tried one in my Sinclair ZX81, and it works quite well.

The MB8128 is a very good value since it costs slightly more than half the price of comparable RAM's offered for the Sinclair ZX81. When ordering, use the full catalog number, MB8128-15. The -15 stands for 150 ns access time, adequate for this purpose.

Is it possible to disable the SPACE-key interruption feature during critical stretches of code?

Is it possible to disable screen clearing for the CONT command?

C. Alfred Spencer, Framingham, MA

Put your critical routines in machine code and call them with the USR function. The BREAK function will not work until you return to BASIC. I don't know how to prevent screen clearing after CONT. Try using SCROLL to avoid CONT.--KO

I'm a confused newcomer and would appreciate help! What is the meaning of the numerical value of the Syntactic Sum? For example, in Vol.2 no.12 p.17 is a sum of "53215, 8K". 53215 what? It can't be 53.215 bytes. What then does it mean?

Julian M. Goldman, Brooklyn, NY

The 8K Syntactic Sum program adds the codes for every byte in the computer's BASIC program area. This sum changes if any character, keyword or line length changes. So if you type l where we typed I, you'll get a Syntactic Sum different from the one we publish. Any change except reversing two letters alters the sum.

8K Syntactic Sum was first published in Jun.81; 4K in Feb.81. If you don't have a copy, send us an SASE. See also Fred Nachbaur's letter following.--AZ

When using the 8K version of Syntactic Sum on ZX81s, the machine must be in FAST mode when calling the subroutine with PRINT USR 17376 (or 32736 with 16K RAM.) If the subroutine is called in SLOW mode, the machine invariably crashes. Switch to FAST before entering PRINT USR 17376 (or 32736 for 16K).

If your BASIC program contains a SAVE command, the Syntactic Sum will be less than its true value by 128 before the SAVE command has been executed. This is because after the SAVE is executed, the last character in the label changes to its inverse form (see ZX81 manual, p.81). So to use Syntactic Sum to verify correct entry after typing in a program, first make the computer execute the line(s) containing SAVE before calling the SS routine. Or manually change the last character in SAVE statements to inverse video.

Finally, the original Syntactic Sum article warns against typing NEW after Program 2 has run.

On the ZX81, you may use NEW to your hearts content once the Syntactic Sum program is safely tucked away beyond RAMTOP (see ZX81 manual chap.26). NEW clears memory only up to RAMTOP; since the computer has been fooled by Step 1 into thinking it has 31 bytes less than it actually has, NEW will not remove the ML program. To erase Syntactic Sum, POKE 16388,0 and POKE 16389,68 (or 128 for 16K), then NEW. Or simply reset the computer by pulling the plug.

Fred Nachbaur, El Monte, CA

I am working on an add-on for my Microace with 8K ROM to enable it to use the SLOW mode. It appears to work, but with one big defect: in SLOW, all characters are printed with the bottom part above the top part. I would like to hear from anyone who has any idea on how to solve this problem. If I ever get the circuit to work, I will send plans for it it SYNTAX so other people with a Microace or ZX80 can use ZX81 software.

Jason Harper, Rt. 1 Box 3,
Sylvester, TX 79560

ZX80 owners--can you help?

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NUMBERS HELD INEXACTLY ON THE ZX81

(Fifth and final part of a series)

FOR-NEXT Loop Counters:

The use of non-integral FOR-NEXT loop counters is a powerful facility. The principles discussed previously should help you use them as your servant, not your master.

For example, how would you amend this loop to print the integers 0-10? Before reading the answer, RUN this routine and try to work out what is wrong:

```
10 FOR X=0 TO 1 STEP .1
20 PRINT INT (10*X)
30 NEXT X
```

One answer is:

```
10 FOR X=0 TO 1.05 STEP .1
20 PRINT INT (10*X+.5)
30 NEXT X
```

This illustrates that floating-point systems (like the ZX81) require you to slightly over- or under-state numbers to make the

arithmetic work. The amended line 20 rounds to the nearest integer; amended line 10 overstates the loop limit a little for safety.

You will often need to round an integer N yet again for safety by LET N=INT (N+.5).

Last Note:

I mentioned a subtraction quirk. Even with the amended ROM, $2^{32}-1$ rounds to 2^{32} ; $2^{n+32}-2^n$ rounds to 2^{n+32} ; PRINT $1+2^{**32}-1$ gives 4.6566129E-10 (which is 2^{-31} , not 2^{-32}); .5 is held as $(1/2)-(1/2^{33})$, but PRINT $(1/2)-.5$ gives 2.3283064E-10 (which is not 2^{-33} but 2^{-32} ; and so on. No doubt this "rounding" was done to save bytes.

Now you have enough information, I hope, to be able to cope with it and not be thrown. By the way, $2^{32}-1$ is given accurately by $2^{**32}-2+1$.

Frank O'Hara, Surbiton, Surrey, UK

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MC PROGRAMING: PUSHING AND POPPING

(Part 7 of a series)

In the 4K (ZX80) ROM, the System Variables are at addresses 16384-17423. When processing input or program lines, the Z80A central processor uses the IY register pair "indexed" at 16384. In other words, the system variables area is IY's storage for control data.

While you can use any RAM address for data storage, avoid these addresses:

- 1- 16384-16423 System Variables
- 2- An address-pair that must hold a line number for a statement (such as 16424-16425--first program line)
- 3- Any address-pair to be displayed.

ZX80s won't accept a statement without a "function" so the only place left to store data and machine code subroutines is in REM lines, preferably at line 1.

However, addresses are not the only place to store data. Registers hold data without needing addresses but only 10 pairs are available, so the Z80 keeps register-stored data in the Stack.

This Last In-First Out "box" is an ideal place to hold transient data during processing. But while it is the easiest storage area to use (only two 1-byte instructions to access it), it is also the easiest tool to crash your MC program.

Unfortunately, ZX80 already stores data in the registers you'll want to use. If you "erase" certain data...ZAP! Scrambled screen.

Solution: PUSH a register pair before you use it and POP it before RETURNing to BASIC. PUSH means put data onto the Stack; POP means pull it back off. The commands for these functions are of the form PUSH qq and POP qq where qq is a register pair (IY, IX or another). Check Appendix A of the ZX81 manual or a Z80 programming book for codes. Three rules:

- 1- PUSH the register pair before

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you use it.

- 2- POP the data back into the correct register pair before RETURNing to BASIC (C9).
- 3- Make sure you have one POP for each PUSH: don't push more data than you will POP, and don't POP more data than you have PUSHed.

Remember the Last In-First Out rule: each time you PUSH data, it goes on the top of the Stack. When you POP it, it comes off the top of the Stack.

Next month: CP TESTS FOR BRANCHING

Jon Bobst, Zeta Software, PO Box
3522, Greenville, SC 29608-3522

CORRESPONDING ADDRESSES FOR ZX81:
Systems Variables 16384-16508
First BASIC line No. 16509-16510

Also, Sinclair warns against using A', F', IX, IY, and R register when using SLOW mode. When you return to BASIC, you must be sure IY=4000h and I=001Eh.--KO

TIC TAC TOE--4K/2K

This game runs on a 4K ROM with at least 2K RAM. Enter the program and RUN. Choose who goes first (input starting with a Y=Yes; anything else=No) then enter the number of the square you want to mark. The ZX80 displays your move and its own. Its first two moves are chosen at lines 650-750. All others are forced or random. When the game ends you can play again.

Lines 180, 190 and 200 contain directions for entering graphics (eg., line 180: type 3 spaces, shift Q, 2 spaces, shift Q, and 2 spaces in the quotation marks with no extra spaces or commas).

Raymond Fowkes, Coalinga, CA

```

10 CLS
20 PRINT "TIC TAC TOE"
30 PRINT
40 PRINT "DO YOU WANT TO GO FI
RST?"
50 INPUT A$
60 LET Q=CODE(A$)=62
70 CLS
80 PRINT "TIC TAC TOE"
90 PRINT
100 PRINT
110 LET X=1
120 GO SUB 180
130 GO SUB 210
140 GO SUB 180
150 GO SUB 210
160 GO SUB 180
170 GO TO 240
180 PRINT "3sp shiftQ 2sp shiftQ
2sp"
190 PRINT "1sp";X;"1sp shiftQ"
;X+1;"1sp shiftQ";X+2;"1sp"
200 RETURN
210 PRINT "shiftF 2shiftW";
CHR$(133);"2shiftW33";CHR$(133);
"2shiftW"
220 LET X=X+3
230 RETURN
240 RANDOMISE
250 LET A=0
260 LET C=-1
270 LET P=-1
280 DIM C(4)

```

```

290 DIM P(4)
300 IF Q THEN GO TO 860
310 LET Y=RND(5)*2-1
320 GO TO 780
330 IF C<1 THEN GO TO 530
340 FOR B=0 TO C
350 FOR D=0 TO C
360 LET X=C(D)
370 LET Y=C(B)
380 GO SUB 1030
390 IF Z THEN GO TO 510
400 GO SUB 1050
410 GO SUB 1070
420 IF PEEK(A) THEN GO TO 510
430 GO SUB 1190
440 PRINT
450 PRINT "--I WON--"
460 PRINT
470 PRINT "PLAY AGAIN?"
480 INPUT A$
490 IF CODE(A$)=62 THEN RUN
500 LIST
510 NEXT D
520 NEXT B
530 FOR B=0 TO P
540 FOR D=0 TO P
550 LET X=P(D)
560 LET Y=P(B)
570 GO SUB 1030
580 IF Z THEN GO TO 630
590 GO SUB 1050
600 GO SUB 1070
610 IF PEEK(A) THEN GO TO 630
620 GO TO 820
630 NEXT D
640 NEXT P
650 IF C>-1 THEN GO TO 680
660 LET Y=5-2*(P(0)=5)
670 GO TO 780
680 IF C>0 THEN GO TO 770
690 IF NOT Q THEN GO TO 730
700 LET Y=1
710 IF E=1 OR E=6 OR E=8 OR P(0
)=6 OR P(0)=8 THEN LET Y=9
715 IF ABS (E-P(0))=8 OR (E AND
P(0))=3 THEN LET Y=RND(4)*2
720 GO TO 780
730 LET Y=10-C(0)
740 IF (E/2)*2=E OR E=10-C(C) T
HEN LET Y=5
750 IF C(0)=5 THEN LET Y=9+(E=9
)*2
760 GO TO 780
770 LET Y=RND(9)
780 GO SUB 1050

```



```

790 LET Z=Y
800 GO SUB 1240
810 IF PEEK(A) THEN GO TO 770
820 GO SUB 1190
830 LET C=C+1
840 IF C>3 THEN GO TO 1000
850 LET C(C)=(Z-29-(Z/70)*45)/3
860 INPUT E
870 IF E<1 OR E>9 THEN GO TO 86
0
880 LET Y=E
890 GO SUB 1050
900 LET Z=Y
910 GO SUB 1240
920 IF PEEK(A) THEN GO TO 860
930 POKE A,6
940 POKE A+1,6
950 POKE A+18,8
960 POKE A+19,6
970 LET P=P+1
980 LET P(P)=E
990 IF P<4 THEN GO TO 330
1000 PRINT
1010 PRINT "--TIE GAME--"
1020 GO TO 460
1030 LET Z=( NOT X<Y OR Y=X-5-10
*(X<5) OR Y=10-(X+5*(X>5))*2 OR
(X/2)*2=X AND (Y=5-X/2 OR Y=10-X
/2))
1040 RETURN
1050 LET Y=Y*3+29+((Y-1)/3)*45
1060 RETURN
1070 LET X=X*3+29+((X-1)/3)*45
1080 LET Z=2*Y-X
1090 GO SUB 1170
1100 IF A THEN GO TO 1150
1110 LET Z=2*X-Y
1120 GO SUB 1170
1130 IF A THEN GO TO 1150
1140 LET Z=(X+Y)/2
1150 GO SUB 1240
1160 RETURN
1170 LET A=(Z=32 OR Z=35 OR Z=38
OR Z=86 OR Z=89 OR Z=92 OR Z=14
0 OR Z=143 OR Z=146)
1180 RETURN
1190 POKE A,3
1200 POKE A+1,6
1210 POKE A+18,133
1220 POKE A+19,2
1230 RETURN
1240 LET A=PEEK(16396)+PEEK(1639
7)*256+Z
1250 RETURN
SYNTACTIC SUM: 27909, 4K

```

GRANDSON OF BIG CHARACTERS

John Filley's Son of Big Characters (Feb.81) works only on 4K ROM. Here is an update for 8K ROM/1K RAM. The graphics characters are now in a logical order, so you need no REM statement. But, the Boolean operators AND, OR and NOT no longer operate as bit manipulators as in John's program (ie., Q AND B). Lines like 100 and 102 replace these operators.

This program can display 2 lines of 16 characters in 1K. For inverse video, add 128 to line 110:
110 PRINT CHR\$(ABS (128+C+4*D
+2*E-F*135));

William Wentz, Rio Rancho, NM

```

0010 INPUT A$
0020 LET M=LEN A$
0030 LET L=1
0040 IF M>8 OR L>8 THEN GOTO 10
0050 FOR X=1 TO M
0060 LET Q=CODE A$(X)*8+7679+L
0070 LET R=PEEK (Q+1)
0080 LET Q=PEEK Q
0090 LET B=128
0100 LET B2=B/2
0110 LET C=INT (Q/B)
0120 LET D=INT (R/B)
0130 LET E=INT ((Q-B*C)/B2)
0140 LET F=INT ((R-B*D)/B2)
0150 LET Q=Q-B2*E-B*C
0160 LET R=R-B2*F-B*D
0170 PRINT CHR$(ABS (C+4*D+2*E-F*135
)):
0170 LET B=INT (B/4)
0175 IF B>0 THEN GOTO 97
0250 NEXT X
0255 LET L=L+2
0257 PRINT

```

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```
3350 IF L=8 THEN GOTO 10
3370 GOTO 65
SYNTHETIC SUM: 26.32, 8K
```

IMPROVED DATA INPUT

The way the ZX81 accepts input during program runs is not great compared to most computers. This subroutine improves input using INKEY\$. Use it in your programs to enter data at any screen position instead of the bottom line. Data stays on the screen after entry. The subroutine gives a blinking cursor to show the current entry position and you use RUBOUT and NEWLINE (ENTER) as usual.

As noted in SYNTAX, subroutines run faster when placed at the beginning of a program. It's particularly important that this subroutine be the first thing in a program, or you get a noticeable delay when pressing keys. The only line before this subroutine should

be a GOTO to the main program start. In fact, the subroutine begins after the RETURN because the first lines are executed only once.

Use GOSUB 400 instead of INPUT statements. A blinking block cursor appears on the screen at the current print position (determined by the last PRINT statement). Enter data, using RUBOUT to erase the previous character. Use NEWLINE or ENTER to end the data string. The subroutine returns the input data in the variable C\$. This is a string variable, so if you want numeric data, use the VAL function to convert it.

Lines 190-230 wait for a key-press and blink the cursor. When you first call the subroutine P1 and P2 are set to the current screen print position by PEEKing the system variable S POSN. S POSN (at 16442) holds a value equal to 33 minus the current column and (at 16442) to 24 minus the current row. P3 switches between 1 and 0 using the NOT function to generate the cursor. Line 320 prevents exiting the subroutine without a keypress other than NEWLINE.

Nels J. Anderson, Chestnut Hill, MA

```
160 LET C$=C$+A$
170 PRINT AT P1,P2;A$
180 LET P2=P2+1
190 IF INKEY$<>"" THEN GOTO 190
200 LET P3=NOT P3
210 IF INKEY$<>"" THEN GOTO 240
220 PRINT AT P1,P2;CHR$(P3*128)
230 IF INKEY$="" THEN GOTO 200
240 LET A$=INKEY$
250 IF A$="" THEN GOTO 200
260 IF A$<="Z" THEN GOTO 160
270 IF CODE A$=116 THEN GOTO 320
280 LET C$=C$(1 TO (LEN C$-1))
290 PRINT AT P1,P2;" "
300 LET P2=P2-1
310 GOTO 190
320 IF C$="" THEN GOTO 170
330 FAST
340 PRINT AT P1,P2;" "
350 RETURN
400 LET P1=24-PEEK 16442
410 LET P2=24-PEEK 16441
420 LET P3=0
430 LET C$=""
440 SLOW
450 GOTO 190
SYNTHETIC SUM: 30803, 8K
```

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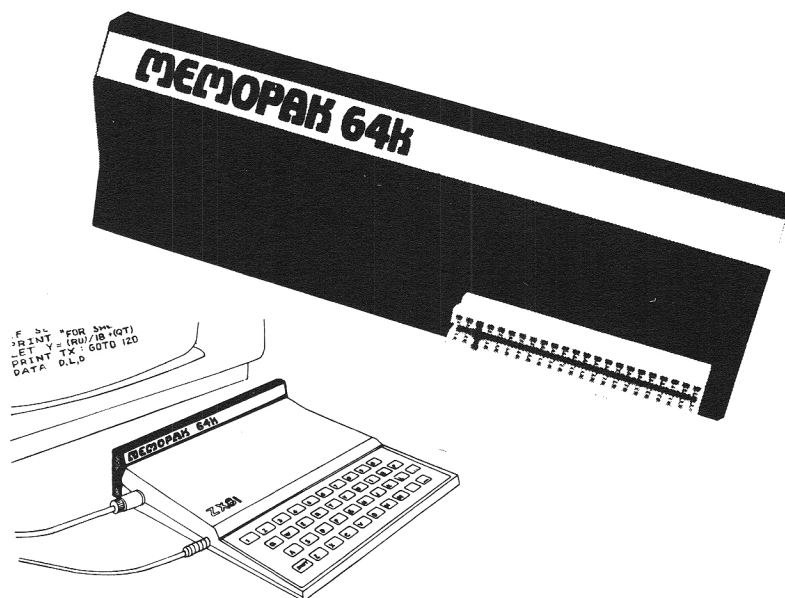
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HARDWARE REVIEW

Product: CAI/O Board and 40-column
Printer Model CAI/P40
From: CAI Instruments, 2559
Arbutus Ct., Midland, MI
48640, 517/835-6145.
Price: CAI/O board \$79.95 alone,
\$69.95 with any CAI peri-
pheral. Printer \$119.95.

CAI Instruments has produced and documented an easy-to-use, relatively inexpensive printer and interface for 8K ZX computers. If you held off buying CAI's Widget, you'll find the CAI/O-printer combination worth the wait.

As CAI's redesigned Widget, the CAI/O board has serial and parallel I/O ports plus CAI's printer interface and tape controller. We only tested the board as it works with the printer. As a side note, the Widget has been streamlined internally to 7 chips and 3 EPROM sockets on a single board.

By ZX standards the printer is fairly large, about 10x7x2". Hook-up could not have been easier. The CAI/O board, needed to run the printer, plugs onto the rear edge connector of the computer. Another connector accepts RAM. The printer plugs into the wall for power and into the CAI/O board via ribbon cable. The simple directions require no technical knowledge.

I had only two small problems: After a few hour's operation, the printer skipped characters in the middle of the paper. Also, my computer crashed with a program loaded but not running crashed after 2 hours. CAI replaced I/O board and printer quickly and the second units have worked perfectly for over a week.

ZX81 keyboard printer commands don't work with CAI's printer. You use USR calls to routines in the printer's internal software. For example, to print out a program in memory, type LET Z=USR 8195. Not as convenient as LLIST, but just as

effective. Six USR calls operate the printer in one of 3 modes: print with variable (like LPRINT), list program in memory (like LLIST) and screen dump (like COPY). Each of these 3 can be printed in either regular or enhanced mode, which is twice normal height. Check page 17 for an example of enhanced mode.

To print, the computer must be in FAST. Internal software creates 3 error codes not used by Sinclair to catch errors, so you won't crash the computer by making a mistake.

You get 40 print columns, which is wider than the ZX80/81's screen display. CAI sells the 4.2" thermal paper at \$1.95/roll (but any thermal paper that size works).

Unlike the Widget, this board and printer don't eat up RAM. They work with 16 & 64K RAMs (the 16K pack needs no changes; for 64K cut out the 8-16K block--DIP switches set to 1-OFF 2-OFF 3-OFF 4-ON).

What I like about CAI's printer: It operates quietly (unlike Sinclair's). It can print in large characters. It is available now. And the documentation is easy to follow and provides simple tests of all functions.

What I don't like: Not being able to use the keyboard printer commands is moderately inconvenient at first, although I quickly memorized the most-used USR calls. Because of the layout of the CAI/O board's edge connectors, attaching these units to 8K ZX80s is unwieldy. The design makes it tough to plug in the power jack. And the 40-column output means you won't get a program listing in screen format, which I find useful for proofreading. Also, the printer puts an extra space after some keywords like LET (see examples on pp. 9 & 17), again messing up the screen format.

But overall, these objections are minor compared to the benefits of these two units. I was very pleased with the performance of my CAI/O board and printer.--AZ

PROGRAM IMPROVEMENTS

Dave Tabor of Menlo Park, CA, sent this version of Leo Morgan's sort routine (Oct.81). It's two lines shorter and avoids Leo's lines 80 and 130 by using an inverted space, which has a higher character code than any standard word. Add back prompts as in Leo's program for a user-friendly routine.

```
10 INPUT N
15 DIM A$(N,20)
20 FOR I=1 TO N
25 INPUT A$(I)
30 NEXT I
40 FOR Y=1 TO N
45 LET F=1
50 FOR X=1 TO N
55 IF A$(F) > A$(X) THEN LET F=X
60 NEXT X
65 PRINT A$(F)
70 LET A$(F) = " "
75 NEXT Y
```

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